Application of Bottom Camera (BOTCAM) Technology to Assess Bottomfish Populations in the Hawaiian Islands

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Abstract:

Population assessment is essential for fisheries management. In order to prevent over harvesting and depletion it is necessary to determine the abundance of any species wished to be harvested commercially. Assessment of the population of any fish species is also crucial to determine its current stock and to plan for its future management. A non-invasive form of technology, the BOTCAM, was used to assess the population of various species of bottom fish along Penguin Banks and restricted fishing area nine (RFA9) near the island of Oahu of the Hawaiian Islands. The BOTCAM is an autonomous ambient-light video system that can be deployed in depths 100m-400m. The BOTCAM uses a two camera stereo-video setup that enables precise measurements and counts to be made. The study is part of an ongoing research project led by Dr. Chris Kelley, director of the Hawaii Undersea Research Laboratory (HURL). This study will provide a baseline count to be used as a comparison in future assessments of the bottom fish populations.

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Introduction:

The deep-sea red snappers (Family Lutjanidae) represented in Hawaii by the Onaga (*Etelis carbunculus*), the Ehu (*Etelis carbunculus*), and the Opakapaka (*Pristipomoides filamentosus*) are of significant economic importance to the Hawaiian Fisheries management programs, run by the State of Hawaii. The Department of Land and Natural Resources (DLNR) and the Division of Aquatic Resources have been collecting statistics on commercial harvesting of these species since 1948. According to the National Marine Fisheries Service (NMFS) research, the main Hawaiian Islands have been over-fished from at least 1989. Even though the snappers are found throughout the entire Pacific, the ones near the Hawaiian Islands are an important subpopulation, both commercially and ecologically.

In July 1998, the State of Hawaii implemented nineteen Bottomfish Restricted Fishing Areas (BRFAs or RFAs), as a result of low spawning potential ratios for Onaga and Ehu (Bottomfish Management Update, 2006). The regulations and reserves were implemented in order to reduce the fishing effort on bottomfish in the Main Hawaiian Islands (MHI) by 15% (Draft Supplemental, 2006). Regulations include a recreation bag limit of 5 Ehu and/or Onaga per person per trip, required bottomfish vessel registration, and banning of longlines, nets, traps, or trawls aimed at bottomfish. The RFAs were created in areas known to contain essential bottomfish habitat and are listed as no-take zones. The protection of these areas should provide a refuge for the bottomfish, allowing the population inside the reserves to increase. Areas surrounding reserves that are protected from fishing in St. Lucia and Florida have shown increases in biomass, abundance, and size of various organisms. It is believed that these increases may due to spillover from the reserves (Robert, 2001). While this study will not determine if spillover is occurring, it will provide the baseline study for the area, as reference for future analysis.

Past methods of assessing the populations of bottom fishes have included catching the fish with nets or trawls. These types of surveys often result in the deaths of the fish. For any species, it is important to have a population assessment method that causes the least amount of damage to a population. Furthermore, when working inside marine protected areas (MPAs) killing the fish is not an option. Recently, various non-invasive methods have been used to conduct the surveys. These non-invasive methods include use of remotely-operated vehicles (ROVs), submersible vehicles, sonar, and dragging a camera behind the boat. The submersible vehicles and ROVS are both very costly to operate, limiting the amount of research that can be conducted.

The National Oceanic and Atmospheric Administration (NOAA) working through the NMFS just completed development on an autonomous deep-water camera station, also known as BOTCAM. This camera permits an investigation of bottom fish populations in a non-invasive setting. By using two lenses with overlapping ranges, one can determine various measurements from any fish to swim through the range of view (Shortis, 2003). Previous experiments with cameras used artificial light to obtain images.

It was found that at these depths, fish avoid artificial light. The BOTCAM makes use of the ambient light to create a black and white image. The camera and the new VIPERFISH software can discriminate between individual fishes when making measurements in one frame. However, fish swim in and out of the camera range, and when making population counts this can become a problem. A count and analysis of the number and size of fishes at the bait stations will provide a new look into the size of these fish populations.

The main goal of this study is to evaluate the reserves for managing a fishery, since in theory the reserves should be increasing population inside the reserves. In theory they may also be increasing the population of the adjacent areas. The hypothesis of this study is that in the eight years since the RFAs were formed the bottomfish population has increased. The null hypothesis is that the population is the same inside and outside the reserve for bottomfish. Since there is no baseline study for the bottomfish populations, this study will become the baseline, and future studies will have to address the population and if spillover is occurring. It is thought that the areas close to the reserve should have greater population counts than those areas further from the reserves. If this proves to be true, it does not absolutely prove spillover. The study will also take place in a variety of topographical features (isolated pinnacles, integrated pinnacles, and slopes) so the data may provide insight on whether or not the feature is related to the rate of recovery. The main data that will come from this study will be the baseline counts of the different species found at each site. This data can be used for future analysis to answer some of these other questions.

Methods and Materials:

At an initial meeting with Mike Parke, Virginia Moriake, Chris Kelley, and Danny Merritt it was decided that the study would consist of 64 camera drops. The sampling effort would be equally split between inside of RFA9 and outside. Using multibeam and sidescan data ArcGIS maps were created of RFA9 and the surrounding penguin banks. Bottomfish habitat was previously determined to be found at 100-400m, in areas of hardness greater than 41 and a slope greater than 20°. The BOTCAM has a range of 100-300m, so that depth was used as the limiting factor. The team was confident that they could drop on an area as small as one hectare (100m x 100m) so any areas smaller than this were discarded (see figure 1). The RFA9 was divided into a lower and upper half and this shape was repeated three times above the RFA and three times below. Eight grids total, were created over the areas meeting the above qualification (see figure 2). Thirty-two drops were two go inside the RFA9, which now consists of two grids. The remaining thirty-two were spread among the three grids below and three above by ratio of prime habitat found in each grid. The thirty-two drops were distributed among the upper and lower RFA9 grids in a similar fashion. A random point generator tool for ArcGIS was used to create the exact location of the drops (see figures 3-5).

The team worked off the boat Wailoa, owned by Randy Cates International. The BOTCAM was deployed off the back of the Wailoa using a winch. The BOTCAM units remained tethered to surface buoy by a line so visual contact could be retained throughout the entire drop. The camera began recording approximately four minutes after shorting and recorded for sixty minutes. Forty minutes after the BOTCAM unit is deployed from the boat the acoustic release is used to separate the unit from the anchor and the surface line was used to collect the BOTCAM. Once on deck, the electronics bottle is hooked up to the computer to verify the data was recorded. Then after reaching the next drop site, the unit can be redeployed. The bait used in the bait canister was a mixture of half squid and half sardines, ground up. A new bait bag was used for each drop.

Each night the data from the electronics bottle(s) was downloaded onto a laptop and backed up onto two separate external hard drives. Later on a third copy was made to ensure the data would not be lost. After the download was completed the memory of the electronics bottle was wiped clean and the unit was allowed to charge for the evening. The seabird data for each unit was downloaded at the end of the night and it was also reset for the next day.

All boat work was completed from June 27 to August 4, 2006. A copy of the data went with me to Dayton, Ohio. All of the video and fish counting is taking place in Ohio. All the footage is watched and the fish count begins once the camera settles on the bottom. Every fish is counted when it swims into the camera range. The number of fish in view is recorded as well as their species. This is done for the full length of the footage until the acoustic release was triggered and the BOTCAM unit leaves the ocean floor. From this data, the time of arrival and time of departure for each species will be determined. The overall maximum number (max null) of fish of each species in one frame will also be determined. This measurement gives the time to the overall max null. The rate of arrival for each species can be determined from these counts. The max null in three minute intervals can also be extrapolated from this data. The counts will be made using the right camera and the left camera as independent sources. Whichever camera has the higher count for the drop will be used for the max null.

Once a calibration file is completed the VMS software can be used to measure any of the fish in the overlapping camera range. All the measurable fish will be recorded. From this data the spawning potential ratio (SPR) can be determined. The spawning potential ratio is commonly used in fishing based surveys, so this may provide a point of comparison for future studies.

Results:

A total of seventy-seven drops were made throughout the summer, sixty of the drops were successful. Thirty drops were completed inside the RFA9 and thirty drops outside. The data for the drops can be seen in Table 1.

The laptop used for analyzing the video was damaged in flight from Hawaii to Ohio and the data analysis could not begin until September 27, 2006. The files are being reviewed at random, to prevent any user-based bias related to location. The goal for completion of video analysis is now the end of November.

Discussion:

Seventeen of the drops made were not successful. The most common reason for failure was the camera was either dropped too deep or too shallow (7 of 17). The other reasons were failure to record, wrong bait canister, or began recording too late. During the first two drops the bait canister failed to open and it was decided that the original bait canister with the programmable release would be replaced with a lobster trap. This means a bait plume is able to escape throughout the entire deployment, including on its way too the bottom. From the video it is easily discernable when the unit hits bottom, so this does not affect counts at all. By using the lobster trap as a bait canister one can also tell from the footage which way the current is flowing. The BOTCAM was designed to view with the current, so the full bait plum would be in view. However, this was not always the case, and sometimes the bait was flowing behind the unit and out of the cameras range.

The drops that were made too shallow or too deep usually also meant that the drop was occurring further away from the computer generated point than normal. In the future, greater care should be taken to make sure the locations are properly reached. A few of the drops that were too deep were near the isolated pinnacle. It was known going into the study that these drops would be risky, so great care was taken to watch the unit after deployment to ensure the buoys stayed at the surface and the unit could be retrieved.

The final boat deployment procedure required at least two crewmembers and the boat captain, but three crewmembers are optimal. The final retrieval method required attaching the unit to the winch cable after reeling it in on the side of the boat, then swinging it around to be lifted by the winch. This procedure was preferred to manually lifting it over the side of the boat due to the unit's weight. Towards the end of the study one of the acoustic units began to fail, it was determined to be a battery problem. Greater care should be taken in future studies to ensure this does not happen. During deployment one crewmember is responsible for recording the location of the drop and the time of deployment. The other crewmember is responsible for cutting the sacrifice line and releasing the unit. Both crewmembers work together to lift the unit and anchors over the back of the boat with the winch as well as attaching the anchor weights with the acoustic release unit. As one crewmember is preparing to cut the sacrifice line the other crewmember stabilizes the unit with an extra length of rope. Afterwards the line is tended to by a crewmember to ensure no knots go out. If a knot or a tangle of line forms, the boat should be slowed and/or stopped and hopefully it can be pulled out. If unable to untangle the line, the unit must be brought back in and redeployed. The most common reason for a tangle was the toggles holding sections of line together getting caught.

The video analysis takes twice as long for each drop, since the right and left camera must be viewed and counted separately. The analysis is being done using Windows media player. All video must be watched for is full duration in order to not miss any fish. Whenever the fish count per frame is high, it drastically slows the process down, as fish swim in and out of the frame it makes keeping individuals identified difficult, and double counts must be avoided. Similarly, all fish need to be counted, and missing a count is not desired. The measurements will later be done using the VMS software. The calibration files for the VMS software are still being completed. Three calibrations files for BOTCAM unit 1 have been completed and later rejected because the error was too great. The allowable error for the calibration files should be decided on in order to ensure a useable calibration file is available in a timely fashion. The pool drops used to create the calibration files had to be re-filmed as well, adding to the delay.

Once the calibration files are completed the measurements of fish can be made. Originally it was thought that most fish in the overlapping range of the two cameras could be measured. After viewing much of the footage to make counts by, the percentage of measurable fish per video seems as though it will be much lower than expected. If the caudal fin of the fish or any part of it's body is bent or twisted the measurement is inaccurate. If the fish is turned more than a certain angle either left or right, it obstructs one of the cameras viewpoints and the measurement cannot be made. Furthermore if another fish blocks any part of the fish's body the view may be obstructed. While the amount of measurable fish is not yet known, it is guessed that this number will be lower than expected.

Evaluation of Learning:

This was my first experience spending time on a boat in the ocean. I used scopolamine patches in the beginning to help with seasickness, but by the end of the study I felt better using no medication. In the future I would probably discontinue the use of the scopolamine patches much sooner as I felt they made me feel ill.

Having a cohesive team was essential for this project. Not only were multiple parties required to deploy and recover the BOTCAM unit, but the parties needed to be knowledgeable in order to avoid mistakes. Every person was responsible for looking out for other people, and it was because of this that any serious injuries were avoided. The days were limited to the boat deck and cabin, so it helped that everyone got along in order to ensure a smooth working day.

As part of this study I learned how to use ArcGIS software in a variety of functions. I am sure this skill will be used in my future career paths and am extremely grateful for the opportunity to learn its functions and uses. I also learned how to use the VNC software, VMS software, Deep Portal software and how to program the acoustic release. Without the teachers I had this summer, the process would have been slowed down greatly, perhaps making it impossible for the study to be completed.

The team had hoped to begin boat work much earlier in June but was unable to due to boat problems and then equipment problems. The learning curve with the BOTCAM units was steep, and often times the failures became quite frustrating. It was important to learn that any new piece of equipment will have its quirks, and each user will have a different adaptation time. We experienced a few days when nothing went as planned including buoy robbers, acoustic release failures, rough seas, and programming problems. It was crucial to see the project through to the end in order to ensure all data was collected. I am very excited to see what future years data brings and what conclusions will be drawn about the RFAs effectiveness.

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TABLE 1. Completed Camera Drop Data

Latitude	Longitude	Drop	Sample	BOTCAM	Date	Time	Area	Depth (m)	Depth Source	Result	Notes
21 5.156	157 39.19	1	0	1	6/27/06	1122	SP2A	187	Fathometer	bad	bait cannister
21 3.4	157 40.38	2	0	1	6/27/06	1423	SP1A	254	Fathometer	bad	bait cannister
21 2.74	157 41.934	3	0	1	6/29/06	1021	RFA	210	Fathometer	bad	failed to record
21 0.997	157 43.085	4	1	1	6/29/06	1202	RFA	249	SeaBird	good	256m fath
20 59.252	157 43.971	5	2	1	6/29/06	1325	RFA	265	SeaBird	good	258m fath
20 57.321	157 44.627	6	3	1	6/29/06	1440	SP1B	169	SeaBird	good	162m fath
21 6.619	157 36.06	7	4	1	6/30/06	1017	SP2A	199	SeaBird	good	216m fath
21 6.275	157 37.615	8	5	1	6/30/06	1135	SP2A	271	SeaBird	good	236m fath
21 3.59	157 41.119	9	6	1	6/30/06	1302	SP1A	278	SeaBird	good	272m fath
21 2.761	157 42.017	10	7	1	6/30/06	1419	RFA	235	SeaBird	good	225m fath
21 2.704	157 41.393	11	8	1	7/3/06	0952	RFA	243	SeaBird	good	232m fath
21 1.289	157 46.215	12	0	1	7/3/06	1125	RFA	273	SeaBird	bad	on late 274m fath
20 59.393	157 43.901	13	0	1	7/3/06	1256	RFA	248	SeaBird	bad	on late 232m fath
20 57.096	157 44.985	14	9	1	7/3/06	1441	SP1B	191	SeaBird	good	185m fath
21 6.687	157 36.303	15	10	1	7/5/06	1044	SP2A	240	SeaBird	good	227m fath
21 6.278	157 37.581	16	11	1	7/5/06	1200	SP2A	215	SeaBird	good	205m fath
21 2.651	157 41.424	17	12	1	7/5/06	1331	RFA	189	SeaBird	good	176m fath
21 2.633	157 42.154	18	13	1	7/5/06	1438	RFA	251	SeaBird	good	249m fath
20 55.493	157 45.083	19	14	1	7/6/06	1021	SP2B	152	SeaBird	good	147m fath
20 54.851	157 45.448	20	15	1	7/6/06	1133	SP2B	292	SeaBird	good	305m fath
20 53.903	157 45.837	21	16	1	7/6/06	1245	SP3B	272	SeaBird	good	274m fath
20 53.395	157 45.797	22	17	1	7/6/06	1355	SP3B	213	SeaBird	good	221m fath
21 2.844	157 40.937	23	18	1	7/7/06	1052	RFA	149	Seabird	good	163m fath
21 2.809	157 41.765	24	19	1	7/7/06	1202	RFA	265	SeaBird	good	
21 1.398	157 42.896	25	20	1	7/7/06	1318	RFA	168	SeaBird	good	144m fath
21 1.241	157 46.074	26	0	1	7/7/06	1437	RFA	315	Fathometer	bad	too deep 269m fat
21 7.696	157 33.101	27	0	1	7/20/06	1005	SP3A	73	SeaBird	bad	too shallow
21 7.657	157 34.177	28	21	1	7/20/06	1116	SP3A	275	SeaBird	good	
21 7.365	157 35.121	29	22	1	7/20/06	1223	SP3A	190	SeaBird	good	
21 6.663	157 36.5	30	0	1	7/20/06	1332	SP2A	162	SeaBird	bad	?

21 6.549	157 37.04	31	23	1	7/20/06	1435	SP2A	230	SeaBird	good		
21 1.233	157 46.187	32	24	1	7/21/06	0903	RFA	295	SeaBird	good		
20 57.171	157 44.852	33	25	1	7/21/06	1026	SP1B	167	SeaBird	good		
20 59.383	157 43.73	34	0	1	7/21/06	1139	RFA	160	SeaBird	bad	?
21 2.752	157 42.034	35	26	1	7/21/06	1438	RFA	235	SeaBird	good	
21 2.642	157 41.502	36	27	1	7/21/06	1540	RFA	180	SeaBird	good	
21 7.189	157 35.323	37	28	1	7/27/06	1031	SP3A	153	SeaBird	good	
21 6.706	157 36.377	38	29	2	7/27/06	1049	SP2A	258	SeaBird	good	
21 6.29	157 37.544	39	30	1	7/27/06	1151	SP2A	210	SeaBird	good	
21 4.937	157 39.628	40	31	2	7/27/06	1213	SP1A	204	SeaBird	good	
21 2.627	157 41.347	41	32	1	7/27/06	1325	RFA	246	SeaBird	good	
21 2.577	157 42.122	42	0	2	7/27/06	1339	RFA	345	SeaBird	bad	too deep
21 1.438	157 42.009	43	0	1	7/27/06	1441	RFA	269	SeaBird	bad	failed to record
20 59.302	157 43.724	44	0	2	7/27/06	1503	RFA	93	SeaBird	bad	too shallow
21 6.595	157 36.504	45	33	1	7/28/07	0912	SP2A	0	none	good	
21 6.5	157 35.988	46	0	2	7/28/07	0936	SP2A	85	SeaBird	bad	failed to record
21 2.605	157 41.952	47	34	1	7/28/07	1059	RFA	0	none	good	
21 2.59	157 41.339	48	35	2	7/28/07	1121	RFA	248	SeaBird	good	
21 1.299	157 43.009	49	36	1	7/28/07	1226	RFA	0	none	good	
21 1.183	157 46.123	50	0	2	7/28/07	1253	RFA	364	SeaBird	bad	too deep
20 53.344	157 45.701	51	37	1	7/31/06	1024	SP3B	155	SeaBird	good	
20 53.646	157 45.646	52	0	2	7/31/06	1035	SP3B	76	SeaBird	bad	too shallow
20 54.846	157 45.261	53	38	1	7/31/06	1158	SP2B	188	SeaBird	good	
20 56.335	157 45.51	54	39	2	7/31/06	1219	SP2B	201	SeaBird	good	
21 1.382	157 42.751	55	40	1	7/31/06	1338	RFA	173	SeaBird	good	
21 1.279	157 46.022	56	41	2	7/31/06	1401	RFA	299	SeaBird	good	
21 2.675	157 41.389	57	42	1	8/1/06	0854	RFA	204	SeaBird	good	
21 2.636	157 42.021	58	43	2	8/1/06	0908	RFA	259	SeaBird	good	
20 53.356	157 45.777	59	44	1	8/1/06	1046	SP3B	237	SeaBird	good	
20 53.81	157 45.745	60	45	2	8/1/06	1102	SP3B	224	SeaBird	good	
20 56.282	157 45.606	61	46	1	8/1/06	1213	SP2B	285	SeaBird	good	
21 2.596	157 42.018	62	47	2	8/1/06	1339	RFA	287	SeaBird	good	
21 2.903	157 41.747	63	48	1	8/1/06	1357	RFA	254	SeaBird	good	

21 2.707	157 41.309	64	49	1	8/2/06	0936	RFA	242	SeaBird	good	
21 2.504	157 42.122	65	0	2	8/2/06	0951	RFA	334	SeaBird	bad	too deep
21 6.623	157 36.004	66	50	1	8/2/06	1133	SP2A	105	SeaBird	good	
21 8.664	157 33.074	67	51	2	8/2/06	1253	SP3A	200	SeaBird	good	
21 5.125	157 39.109	68	52	1	8/2/06	1419	SP2A	154	SeaBird	good	
21 2.598	157 42.116	69	53	2	8/2/06	1528	RFA	298	SeaBird	good	
21 2.625	157 42.026	70	54	1	8/3/06	0948	RFA	252	SeaBird	good	
20 59.371	157 43.846	71	55	1	8/3/06	1105	RFA	204	SeaBird	good	
21 1.162	157 46.181	72	0	2	8/3/06	1214	RFA	324	SeaBird	bad	failed to record
21 3.353	157 40.318	73	56	1	8/3/06	1421	SP1A	167	SeaBird	good	
21 2.714	157 41.839	74	57	2	8/3/06	1443	RFA	114	SeaBird	good	
21 1.239	157 46.209	75	58	1	8/4/06	0927	RFA	297	SeaBird	good	
21 2.782	157 41.923	76	59	1	8/4/06	1116	RFA	187	SeaBird	good	
20 59.349	157 43.725	77	60	1	8/4/06	1242	RFA	125	SeaBird	good	

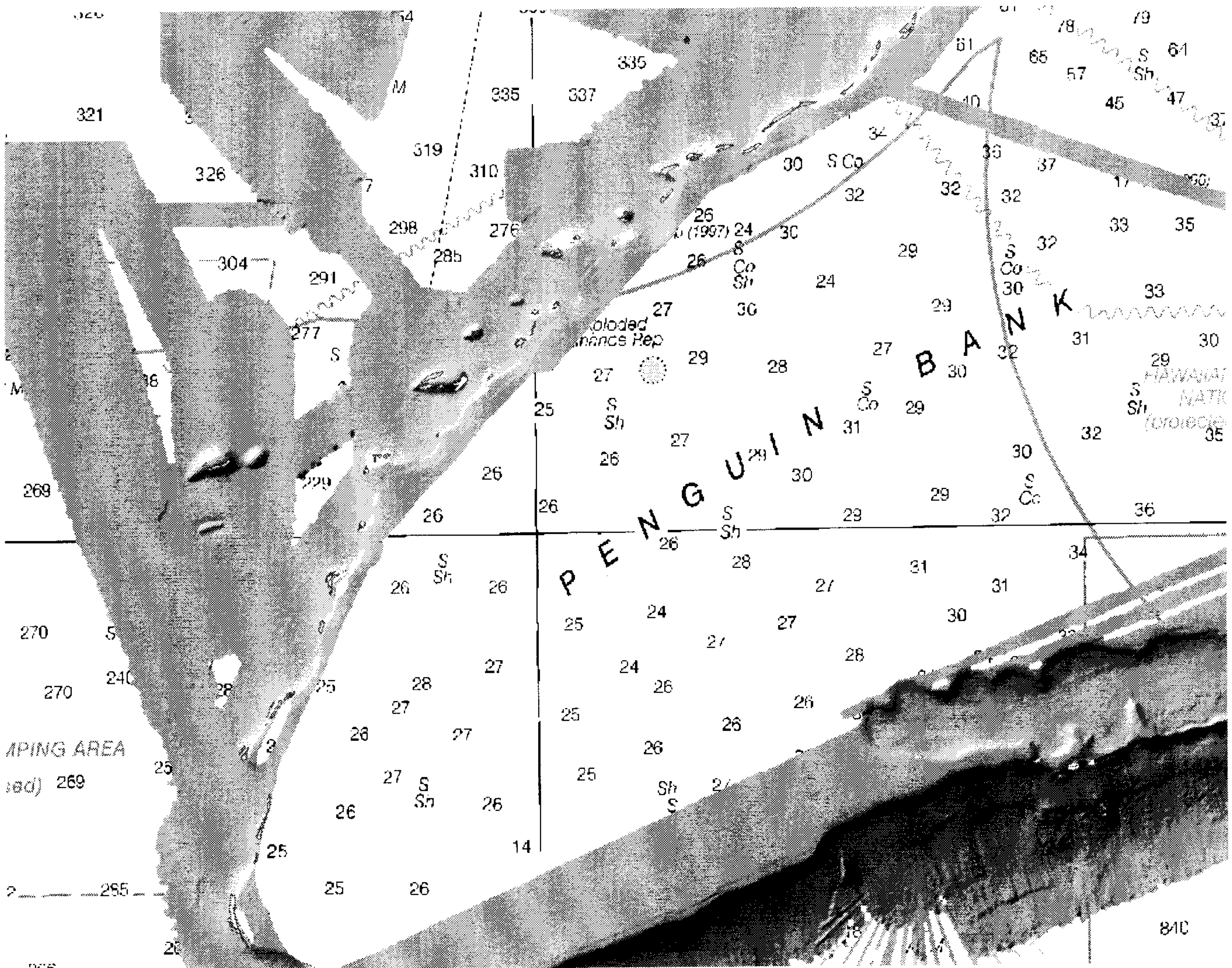

Figure 1. Shown in light blue areas that qualify as being 100m-300m deep, hardness greater than 41, slope greater than 20°, and larger than a hectare.

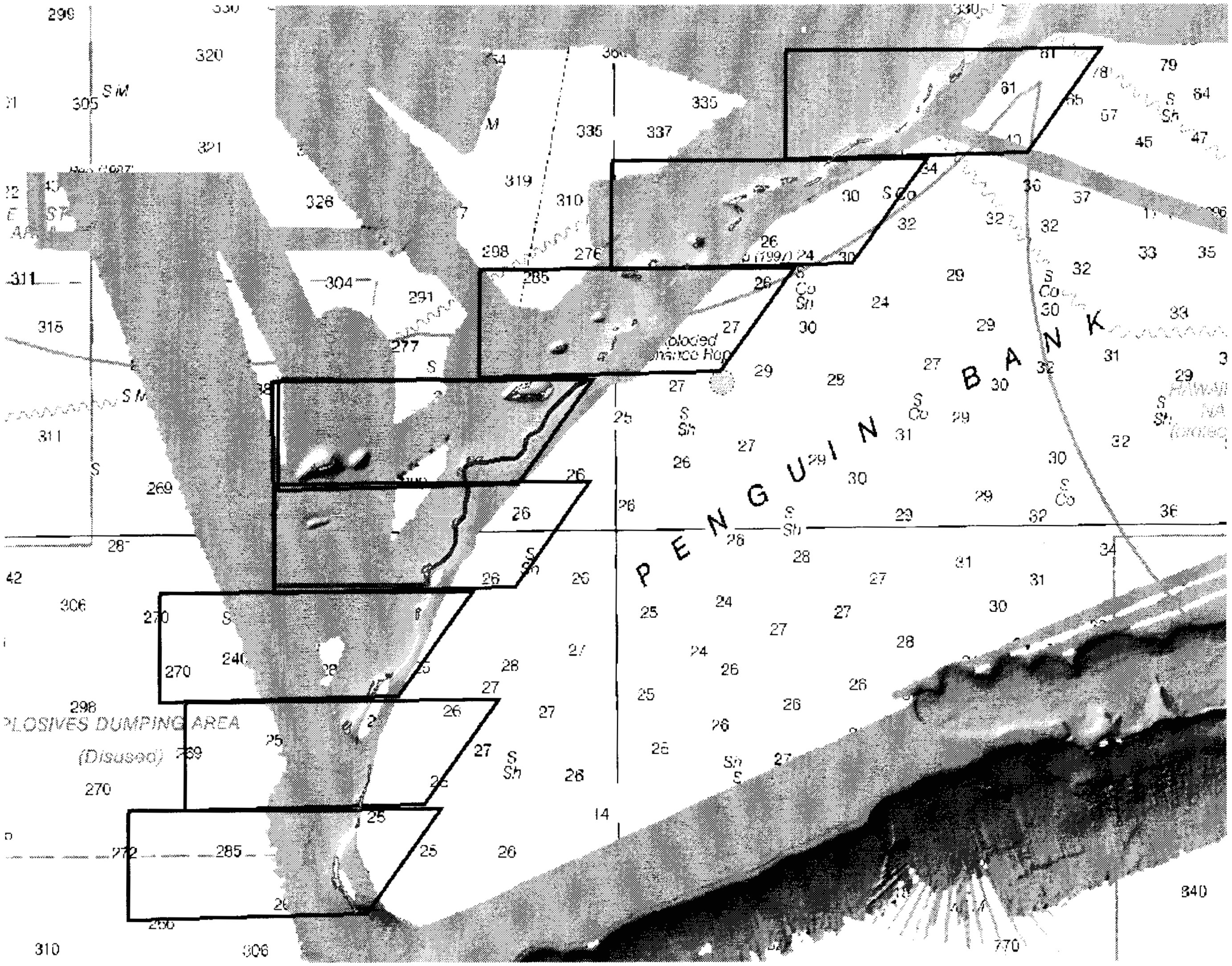

Figure 2. The black lines outline the eight grids. The purple lines mark the boundaries of RFA9. The light blue areas represent the areas meeting the depth, hardness, and slope requirements.

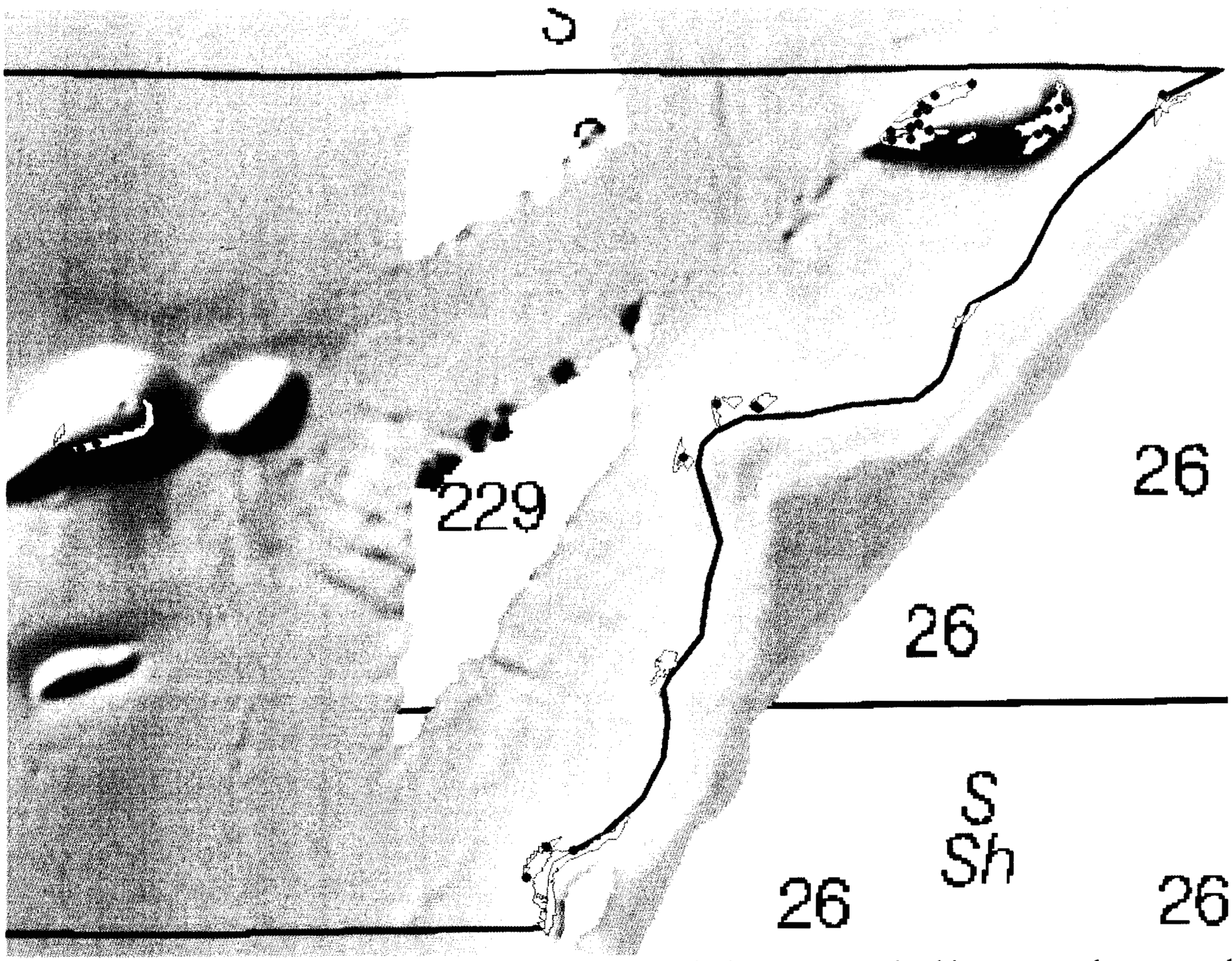

Figure 3. The purple outline represent the boundaries of RFA9. The purple dots represent the thirty-two random spots placed inside of RFA9. The light blue areas represent the areas meeting the depth, hardness, and slope requirements.

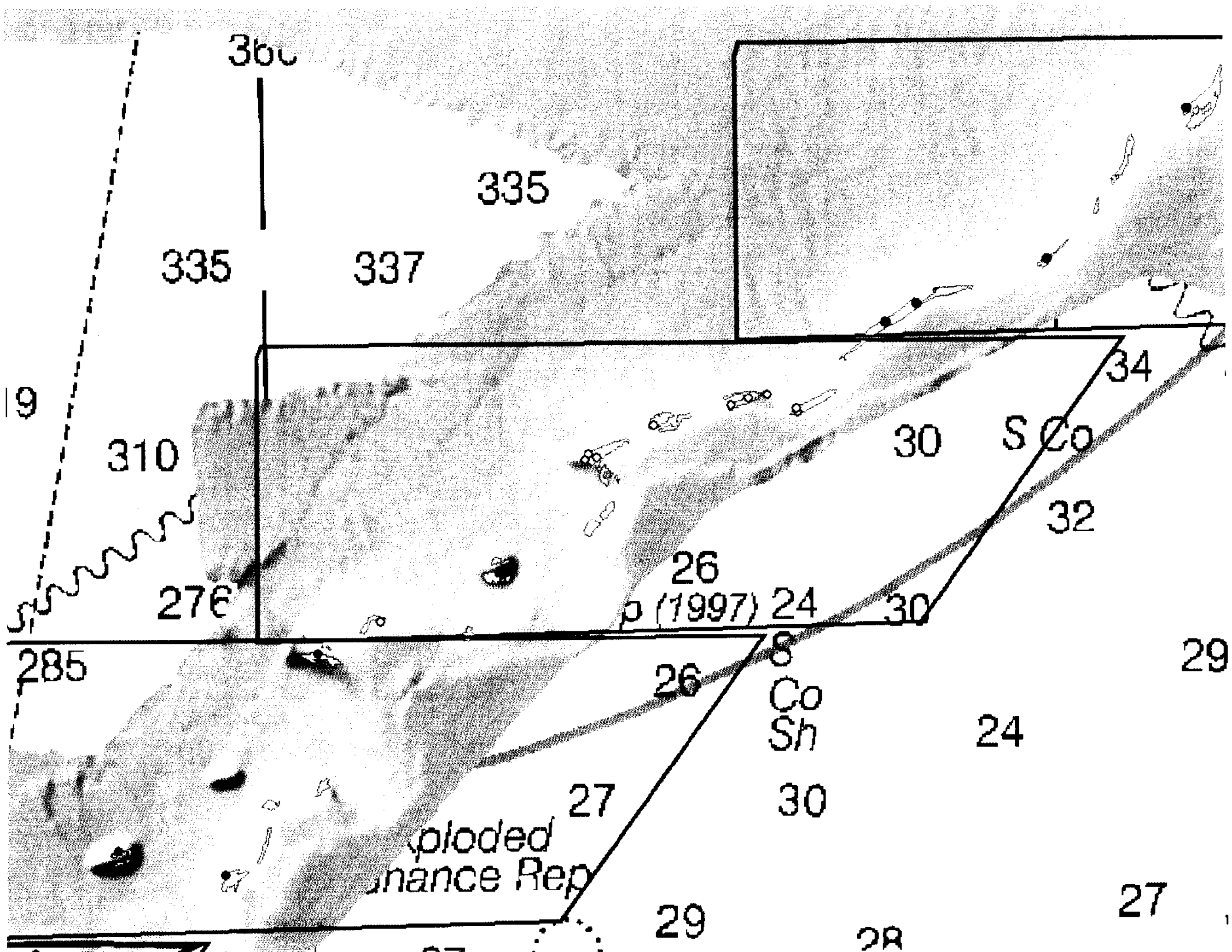

Figure 4. The black outlines the three grids above RFA9. The green, yellow, and pink dotes represent the computer generated random points distributed in the three grids above RFA9. The light blue areas represent the areas meeting the depth, hardness, and slope requirements.

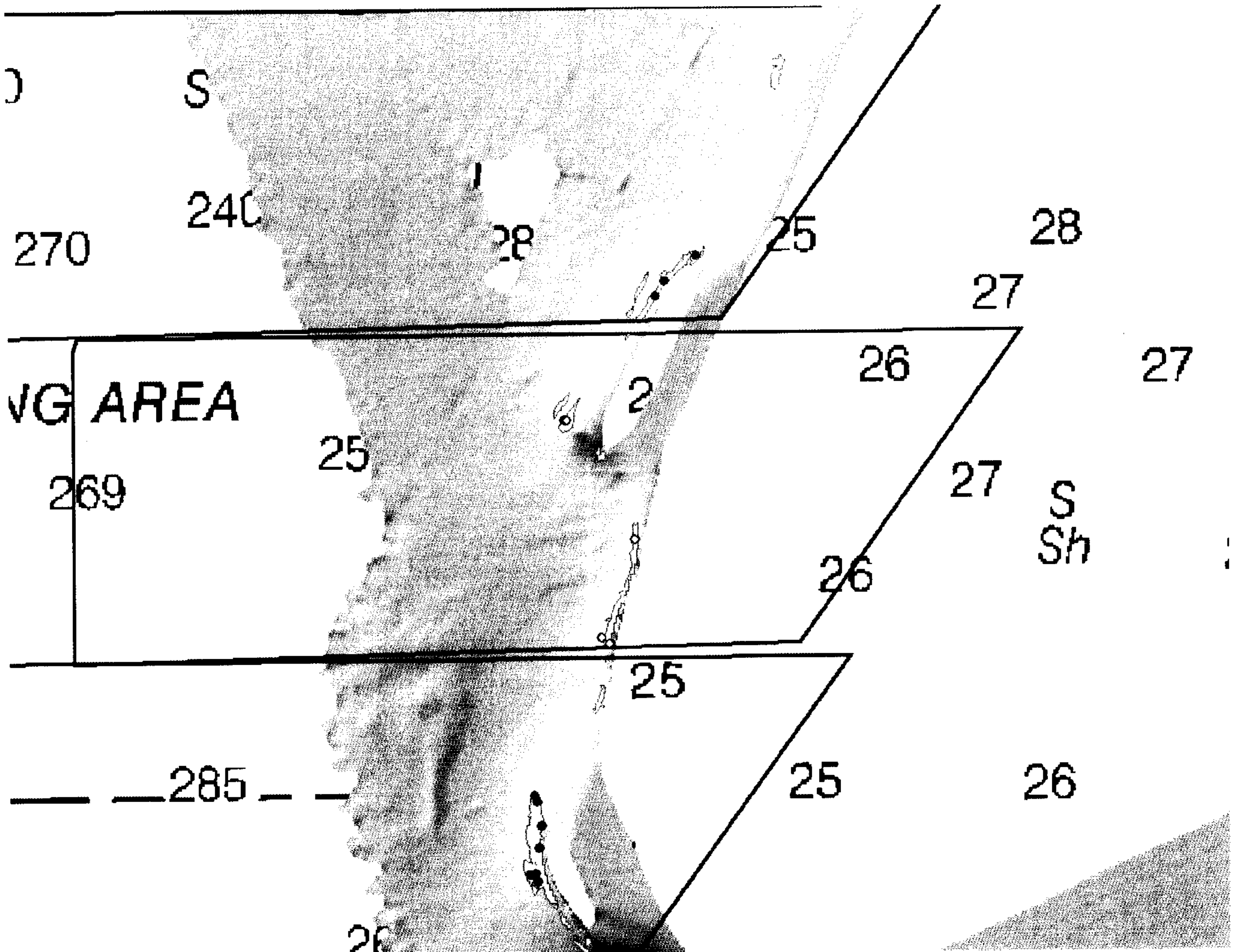

Figure 5. The black outlines the three grids below RFA9. The green, yellow, and pink dots represent the computer generated random points distributed in the three grids below the RFA9. The light blue areas represent the areas meeting the depth, hardness, and slope requirements.

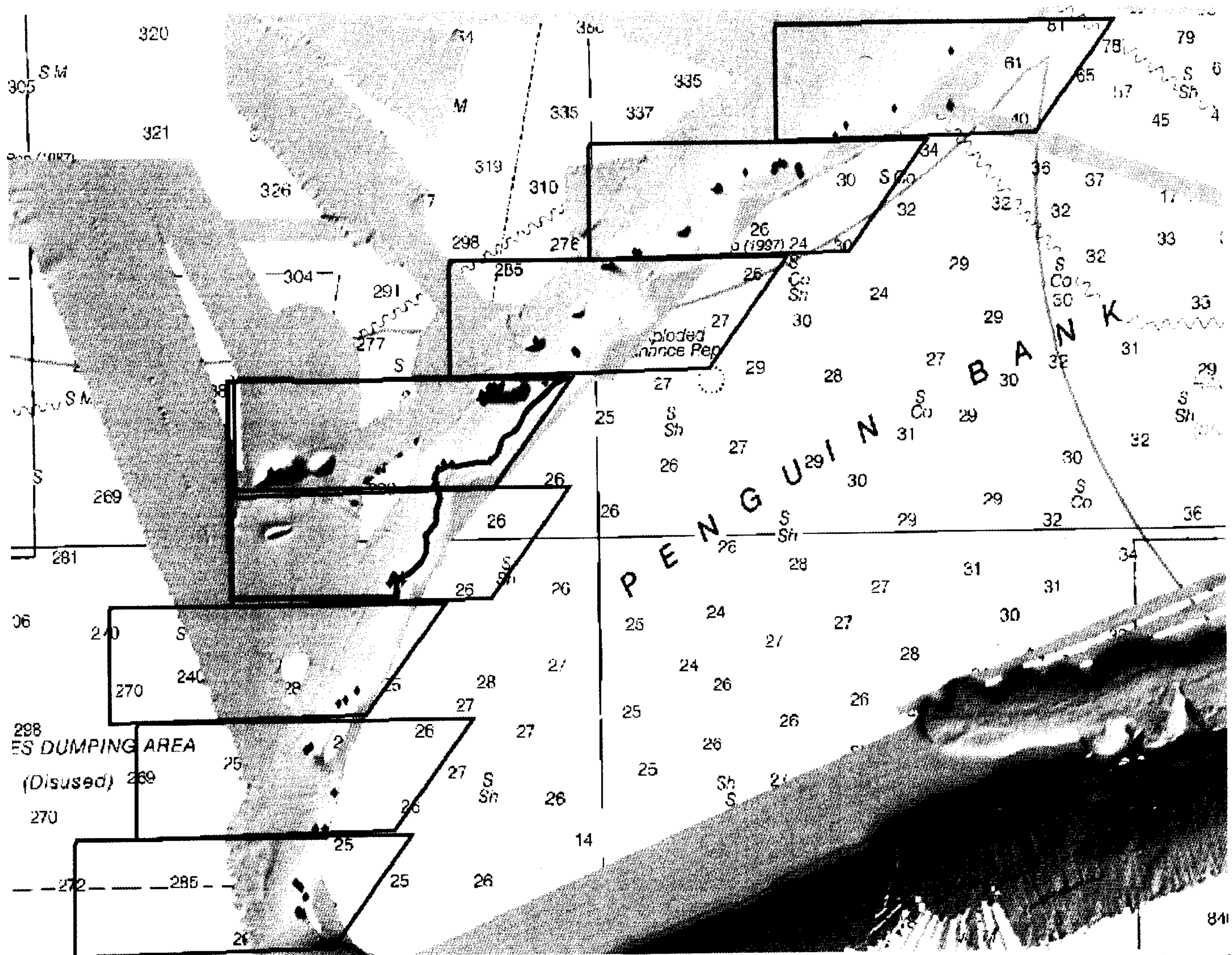

Figure 6. The black shapes outline the eight grids used in the study. There are three above RFA9, three below, and two inside. The purple outlines RFA9. The green diamonds represent all 77 drops conducted in the summer of 2006.

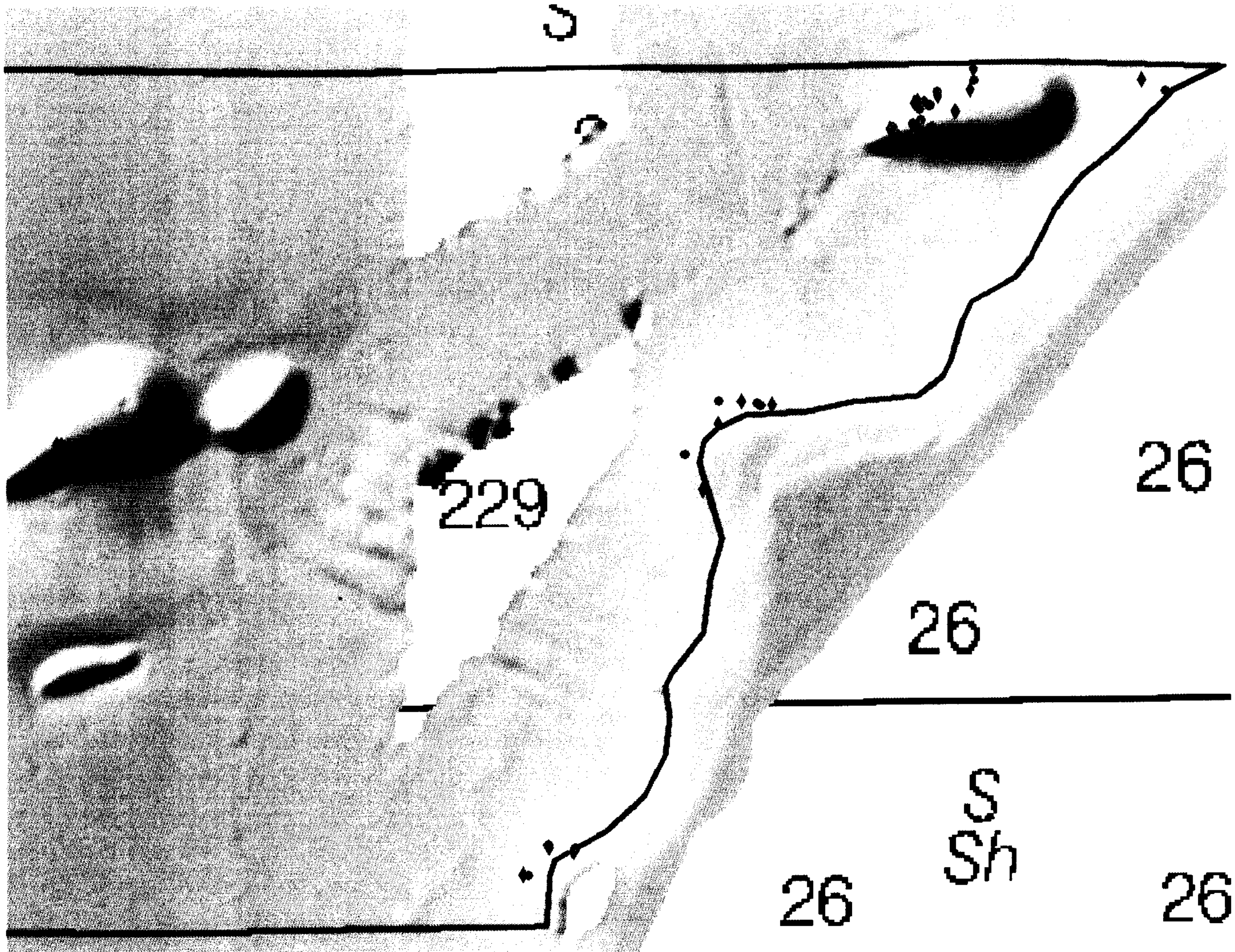

Figure 7. The purple line represents the boundaries of RFA9. The blue diamonds are the 30 sites actually dropped on during the summer of 2006. The purple circles represent the computer generated drops.

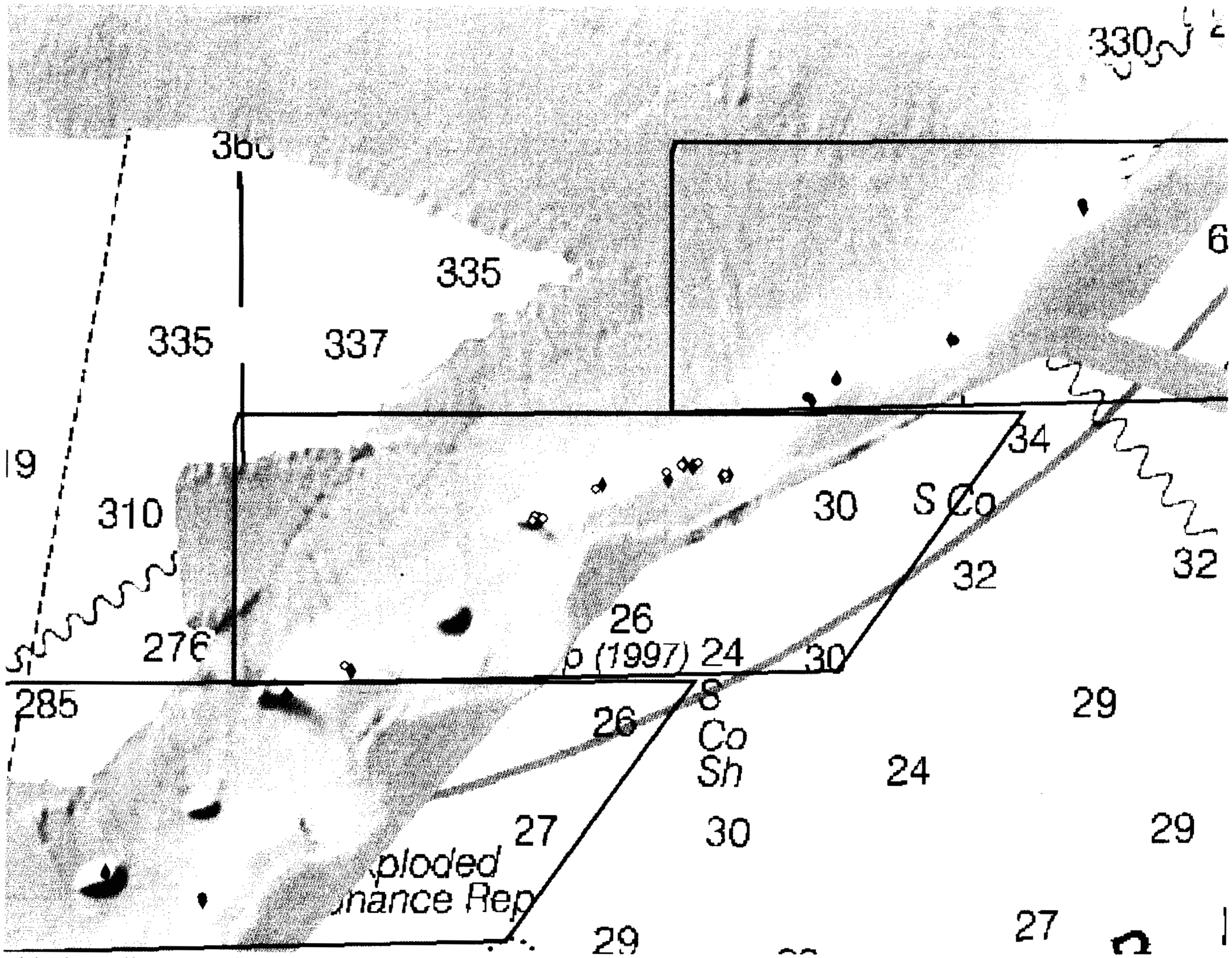

Figure 8. The black outlines the three grids above RFA9. The pink, yellow, and green circles represent the computer generated drop sites above RFA9. The blue diamonds are the sites actually dropped on during the summer of 2006.

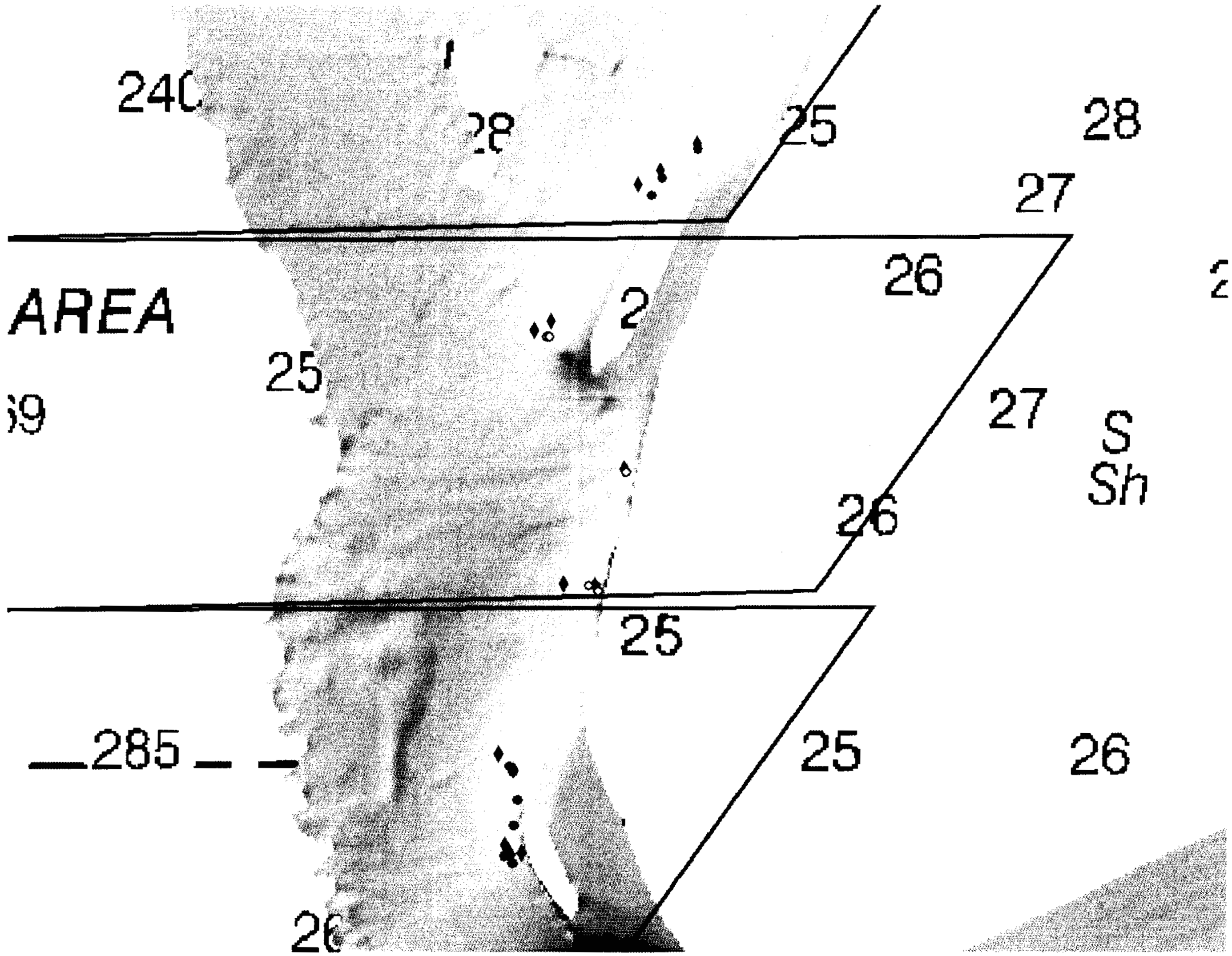

Figure 9. The black outlines the three grids below RFA9. The pink, yellow, and green circles represent the computer generated drop sites below RFA9. The blue diamonds are the sites actually dropped on during the summer of 2006.

Appendix A:

Gear List:

- BOTCAM Unit
    - Lens caps (2)
- Charger
    - Cord to unit
    - Plug to wall
- Electronics bottle
- Dummy plugs
    - Electronic bottle (2)
    - Cameras (2 per camera)
- Data cable
- Wrench (to reattach electronics bottle)
- U-clamps (2)
- Nuts for U-clamps (4)
- Laptop
    - SeaTerm program
    - DeepPortal program
    - Vnc-4_1_2-x86_win32_viewer.exe program
    - Laptop power cord
- Bait arm
- Lobster Traps (2 per BOTCAM unit)
- Strobe (synch) device
    - Extra batteries (D)
    - Backup strobe device
- Cable ties (large)
- Cable ties (small)
- Yoga Mats
- O-rings
- Natural fiber line for anchor
- Cutaway knife
- Surface line (400m)
- Extra line sections
- Large white buoys (at least 1 per BOTCAM unit)
- Smaller orange buoys
- Sacrifice Line
- Carabiner to attach to winch
- Seabird (2 per BOTCAM unit)
    - Transfer cable
    - Extra batteries (9V)
- Surge Protector
- Acoustic release box
    - Pinger

    - Charger cord
- White acoustic release units (1 per BOTCAM unit plus 1 extra)
- Electric tape
- Staging line
- Flathead screwdriver
- Support rope
- Bait (1 bag per drop)
- Blocks (3 per drop)
- Towel

Appendix B:

How to change the IP Address so the BOTCAM can communicate with the laptop

1. Open Control Panel (left-mouse click 'Start', left-mouse click 'Control Panel')
2. Open 'Network Connections'
3. Right-mouse click on 'Local area Network connection'
4. click on 'Properties'
5. double click on Internet Protocol (TCP/IP)
6. Switch to 'obtain an IP address automatically'
7. click ok
8. click ok

laptop should now be communicating with the Botcam

To verify:

1. Open control panel
2. Open network connections
3. Double left-mouse click on 'Local area network connection'
4. click on 'Support' tab
5. IP Address should read "192.168.1.1"

Appendix C:

Acoustic Release Setup

Model #	AR701AE
Serial #	198
Release Code	BD03
Arm Code	BDB7

Model #	AR701AE
Serial #	196
Release Code	BD01
Arm Code	BDB7

Transducer connects to XDC
Charger connects to 24 VDC

1. Turn power on
    a. If lower power will be indicated by a light
2. Push 1 tx/rx settings
3. Push 1 Immediate transmit
4. Push scroll button
    a. Go to AR7XX
    b. Type in "BDB7" press enter
    c. Type in number that goes with BD
    d. Hit enter
    e. Hit enter again
5. Push enter to transmit

Push enter to close → 2 noises then spins sealed
Push enter to open→ 2 noises then opens

Appendix D:

Programming Using VNC

1. check IP address is correct on Local Area Network Connections
    a. should be 192.168.1.1
2. open vnc-4_1_2-x86_win32_viewer.exe
3. press F1
4. press F5 to stop recording
5. Use F2 to scroll for field "Configuration
6. press F4, should say "Basic"
7. press F4
8. "lens setup" records for 5 seconds and then shows it to you (a way to check on cameras)
    a. don't normally need to use this feature
9. press F3
10. "set id"- way to make new configuration programs, easier to run off of Deep Portal
11. press F3
12. "load id"- allows you to load the various configuration files (each has an ID)
13. press F3
14. "timezone"- press F4 to find correct one
    a. scroll with F4 to TZ: World UTC
    b. F1 to save time zone
15. press F3
16. "set date"- press F4 to change, F1 to save
17. press F3
18. "record extend"- how long you actually record- F4, F5 to change
    a. F1 to save
19. press F3
20. "record delay"- should be NO DELAY
21. at "lens setup" hit F1 to go back a menu
22. use F2/F3 to scroll to "Advanced"
23. "startup mode" should say "Record"
    a. leave as record
24. press F3
25. "record quality" should say "Special"
26. press F3
27. "record FPS" should say "30" (will record at 30 frames per second)
28. press F3
29. "video standard" should say "NTSC"
30. press F3
31. "subtitle position" should say "Bottom"
32. press F3
33. "brightness" should say "128"
34. press F3

35. “contrast” should say “128”
36. press F3
37. “hue” should say “128”
38. press F3
39. “saturation” should say “128”
40. press F3
41. “resolution” should say “720x486” (maximum resolution)
42. press F3
43. “sensor setup” (leave)
44. press F3
45. “sensor readings” (leave)
46. press F3
47. “audio” should say “mono PCM Mic” (leave)
48. press F3
49. “overwrite protect” should say “off”
    a. will overwrite if recording past memory, be sure to cleanup data saved on BOTCAM unit frequently to avoid overwriting
50. press F3
51. “max record size” should be “1.2 GB”
52. press F3 to save
53. press F1 to go back a menu
54. use F3/F2 to scroll for “System”, press F4 (go)
55. “startup trigger” should say “timer”
    a. will start recording when you short the plug”
56. press F3
57. “startup delay” use F4 to adjust
    a. put in delay 20 minutes for deep drops
    b. F3 to save configuration
58. “alarm event” record (For bait release)
    a. F3 (to save)
59. “alarm duration” should be 00:10:00 (10 minutes)
    a. needs to be 10minutes to make sure burn wire burns
    b. F3 to save
60. “alarm delay” adjust with F4/F5
    a. change to allow unbaited section
    b. with no delay bait released after ~5minutes
    c. F3 to save
61. “Int Battery Min” should be 13.4v
62. press F3
63. “Ext Batt Min” should be 12.8v
64. press F3
65. “disk used” shows how much disk space on the BOTCAM is used
66. “serial” “4063E41073” (do not change)
67. press F3
68. “IPO” (do not change)
69. press F3

70. "IPI" "192.168.1.1" (do not change)
71. press F3
72. "S/W version" ":0.97-138" (do not change)
73. press F3
74. "reset" (would reset to default values)
75. press F3
76. "clone"
77. press F1, F1
78. scroll to "Shutdown" with F3/F2
79. F4 (go)
80. F3 (ok)

VNC will shutdown
BOTCAM is now ready to record based on settings just programmed

Appendix E:

BOTCAM Previewing/Downloading Footage

1. Plug in power source
    a. Power source toggle switch should be on "charge"
    b. Connect power source to BOTCAM
    c. Connect shorting plug (attached to BOTCAM) to dummy plug
2. Connect BOTCAM to computer via purple Ethernet cord
    a. Computer should be on (make sure batteries aren't too low)
3. Turn power source on
4. Switch power source to "wake-up"
5. Once unit and computer are connected (green light on purple Ethernet connector should be on and lower right screen of computer should say connected)
    a. Open program vnc-4_1_2-x86_win32_viewer.exe
    b. Check IP address is correct 192.168.1.1
        i. Click "ok"
    c. At enter password screen- type "password"
    d. Hit F1 (brings up menu for softkeys)
    e. Hit F5 (to stop recording)
6. To Preview files
    a. Open deep portal
    b. Open → recent → 192.168.1.1/vf/myvf
    c. Can preview footage
        i. Speed through as quickly as 32x

    at this point files are still on the BOTCAM unit- not on the laptop

To Download from BOTCAM to Computer

1. right click on Start (bottom left screen)
2. click "explore"
3. in address type "\\"
    a. file "\\192.168.1.1" should appear
    b. open folder "vf"
    c. open folder "video"
4. highlight all the files you want copied
    a. copy to folder (make sure to note name)

*when previewing/downloading be sure not to get cables, power source, or computer wet

**will want to download if you have enough time before redeployment (and weather conditions allow it)

Appendix F:

Using Sea-Bird

1. Start → All Programs → Sea-Bird → SeaTerm
2. Click on Configure Toolbar
   a. Click on SBE 39
   b. COMM PORT should be 1
   c. Baud Rate 9600
   d. Press ok
3. type in "ds"
4. information on settings (or previous data recordings) will appear
5. check time interval
   a. to change type "interval=x" (x=# of seconds)
6. to cancel data (erase the memory)
   a. type "samplenum=0"
7. to start collecting data
   a. type "startnow"
   b. "ds"
   c. screen should now say "logging data"
8. to upload
   a. press upload
   b. select range of data to be uploaded
   c. type in header name
   d.
9. hit disconnect, close program
10. reattach the dummy plug (check the seal before redeployment)
11. The Sea-Bird uses a 9v battery. It will run down to 6v but should be changed before that.